

CLIMATE CHANGE AND COASTAL ADAPTATION: USING GIS AND VISUALISATION TO IDENTIFY ISSUES AFFECTING COASTAL COMMUNITIES IN ABERDEEN, SCOTLAND, UK

David Green, Guillaume De La Fons, Thomas Bedford, & Thomas Danks

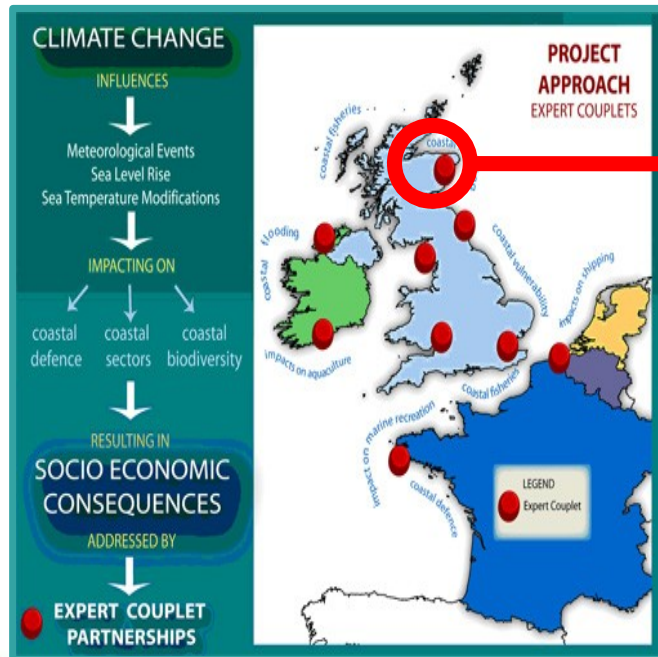
AICSM - University of Aberdeen & Aberdeen City Council

IMCORE

- IMCORE = Innovative Management for Europe's Changing Coastal Resource
- Funded under the EU Interreg IVB programme (www.nweurope.eu) - North West Europe
- Project goal is to promote a **trans-national, innovative and sustainable approach** to reducing the Ecological, Social and Economic impacts of climate change on the coastal resources of North West Europe.
- Partners composed of **expert couplets** from different countries in NW Europe (UK, Ireland, France, and Belgium)



EXPERT COUPLET NODES (ECNs)



**UNIVERSITY OF ABERDEEN & ABERDEEN
CITY COUNCIL:**

Each ECN to (a) Identify **Climate Change Issues**, (b) **Develop Scenarios**, and (c) work towards an **Adaptation Strategy** for the ECN area

GIS SUPPORT & TOOLS

- ECN to develop a series of **Workshops** to interface with stakeholders

Three Workshops:

- Climate Change and Coastal Communities – Awareness and Education
- Climate Change Scenarios Workshop – Generate CC Scenario(s)
- Coastal Adaptation Strategy Workshop – Generate CC Adaptation Strategy
- University of Aberdeen – GIS and GeoVisualisation Support and Tools
- GIS and Visualisation – a recurring theme throughout IMCORE



WORKSHOP 1 - CLIMATE CHANGE & COASTAL COMMUNITIES

- The aim of this workshop was to provide an introduction to climate change and the potential issues it will create in the future
- What does Climate Change mean to you and your job?
- What are the major issues concerning Climate Change affecting you and your job?
- What are you and your organisation doing about Climate Change?

SUMMARY OF POSSIBLE LOCAL IMPACTS

- Increased temperatures from 2° to 3.5° C by 2080
- Increase in winter rainfall by 25%
- More intense storms
- Less snowfall by 90%
- Greater incidence of strong winds and larger waves
- Increased flood risks from rivers and seas, as well as possible sea level rise of 61cm
- Water temperature increase may affect geographical distribution of marine species and thus abundance of commercial species and marine mammals



(Source UK Climate Projections 09)

WORKSHOP 2 - SCENARIOS

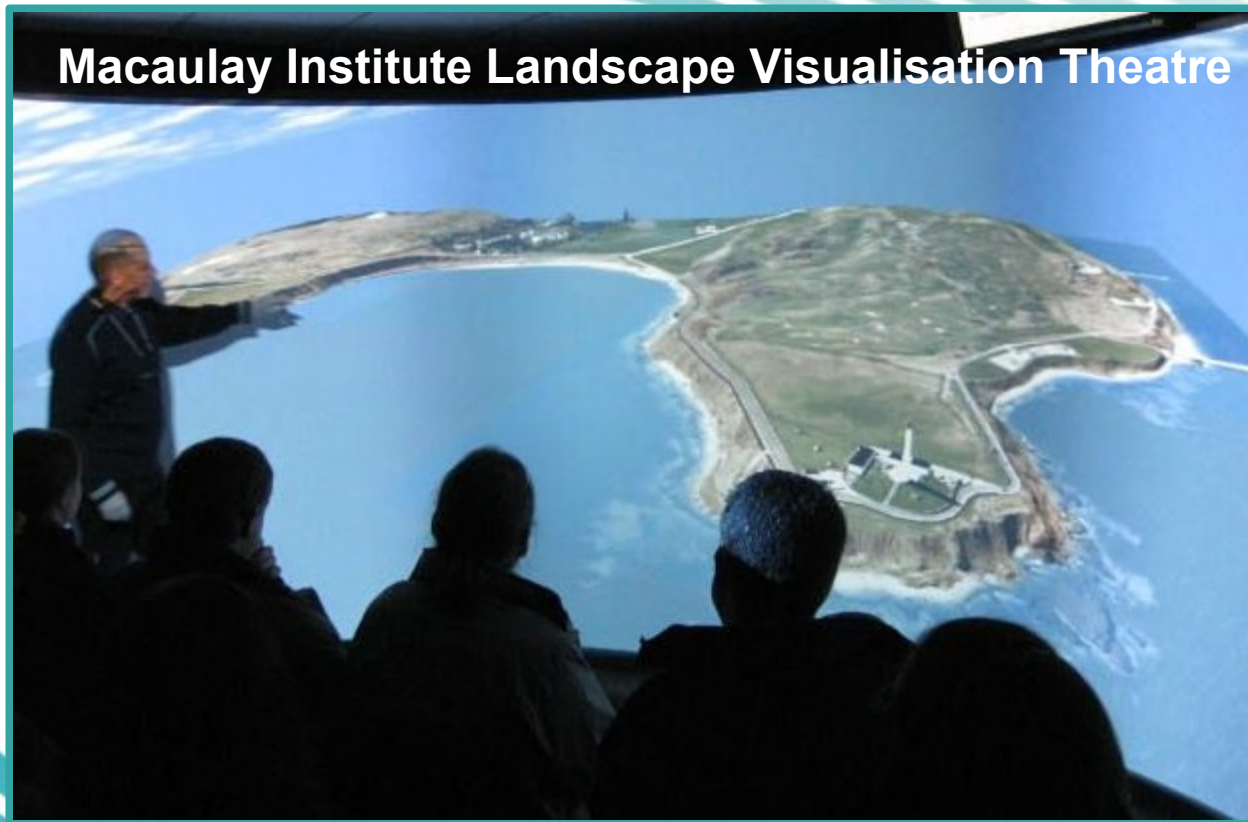
WORKSHOP

● The aim of this workshop was to raise awareness about the Impact of Climate Change on **Flooding in Coastal Communities** in Aberdeen and Aberdeenshire. Delegates were given the opportunity to investigate some potential effects of Climate Change on flooding scenarios. They used **spatial datasets, GIS technology and other tools** to **visualize** the flooding scenarios

- Introduction
- Presentation
- Quiz
- Games
- Team work
- Physical and human aspects

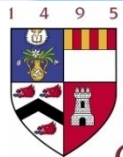


VISUALISATION



GIS

Impact of Climate Change on Flooding in Coastal Communities Workshop 31st May 2010
GIS Task Human Aspects Team Output



UNIVERSITY
OF ABERDEEN



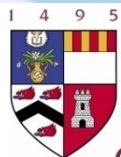
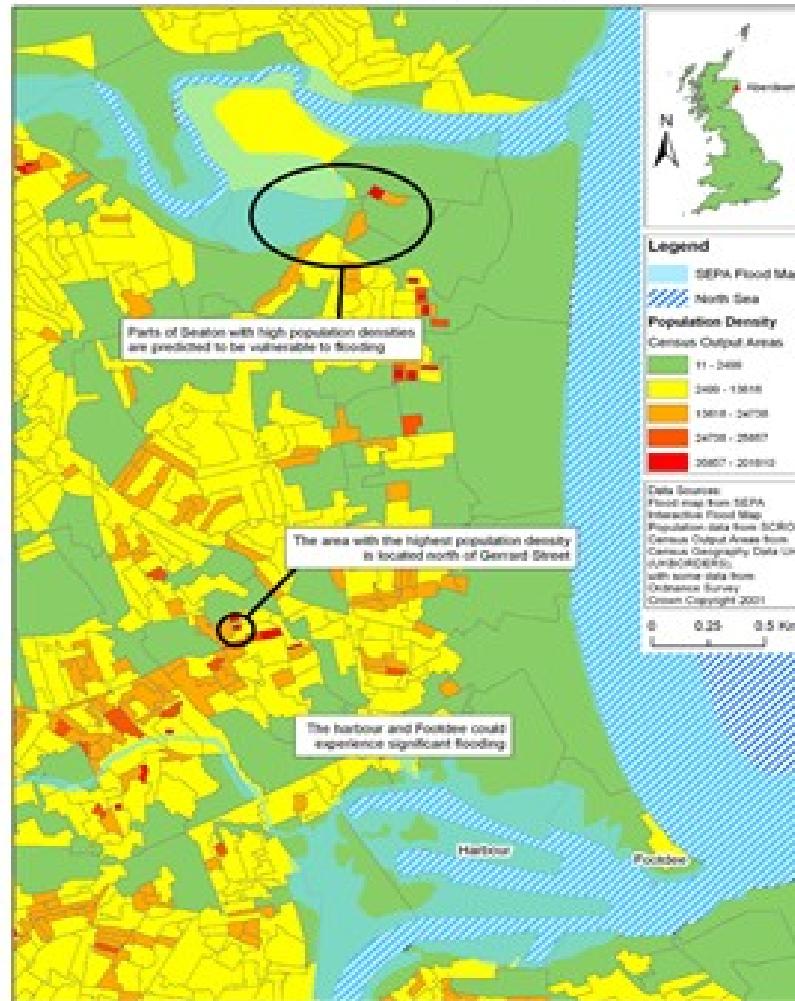
INNOVATIVE MANAGEMENT FOR EUROPE'S CHANGING COASTAL RESOURCE



ABERDEEN
CITY COUNCIL

GIS

Impact of Climate Change on Flooding in Coastal Communities Workshop 31st May 2010 GIS Task Human Aspects Team Output



UNIVERSITY
OF ABERDEEN



WORKSHOP 3 - COASTAL ADAPTATION STRATEGY

- Developing a **Coastal Adaptation Strategy** for Aberdeen and Aberdeenshire
- Use **PESTLE analysis** and **Backcasting Scenario techniques** to develop the strategy
- Learn from the **good practice** and experience of two other
IMCORE Partners: Belgium and the East of England



ADAPTATION STRATEGY GUIDELINES



Guide for the development of climate change adaptation strategies

Methodology for IMCORE ECN areas

November 2010

DRAFT – IMCORE internal use only



WP 4.2 and 4.3



PESTLE ANALYSIS

- **Selected scenario:** Coastal flooding in Aberdeen and Stonehaven is predicted to increase in the future and the aim is to reduce the socio-economic impact caused by this flooding to a minimum
- Use **PESTLE** analysis: Political, Economic, Social, Technological, Legal and Environmental analysis

PESTLE ANALYSIS

Political

- Politicians aware of coastal issues and problems.
- Ensure participation of NGO's and community organizations in development of political initiatives (10).
- Regional policy developments closely linked to evidence-base and mainstream strategies (1).

Economic

- Coherent working between regional organisations leading to integrated and consistent regional approach (6, 10).
- Optimal economic development of coastal opportunities (11).
- Resourcing adequate to avoid short-term reactive planning (7, 9).

Social

- Community Based Organisations (CBO's) are active in coastal decision making.
- Local community and CBO representatives formally involved in regional management architecture.
- Support for entrepreneurship of coastal businesses that assist with sustainable development (11).

Technology

- Data collection and monitoring strategies coherent across the region - minimal gaps and minimal overlap (1).
- Integrated regional data storage and management with public access facility (1, 8).
- Appropriate technology in place to maintain high environmental quality, especially in terms of pollution (8).

Legal

PESTLE ANALYSIS

- Clear leadership from EU and national policies.
- Integrated regional subsidiarity and implementation of national / international laws and policies (10, 12).
- Awareness of relevant laws and policies within community and NGO sectors.

Environmental

- Evidence base used to provide long-term view of environmental change (4).
- Communities aware of coastal change and potential impacts (6, 9).
- Active local participation in adaptation response such as habitat creation.

BACKCASTING SCENARIO

- Fundamental to the overall process is to start this analysis from the preferred future and then work backwards to identify actions that will connect the future to the present
- Backcasting asks: *"if we want to attain a certain goal, what actions must be taken to get there?"*
- Backcasting elucidates the steps necessary to move back from the future to the present day and decide what is required to happen to make it happen.

GROUP WORK

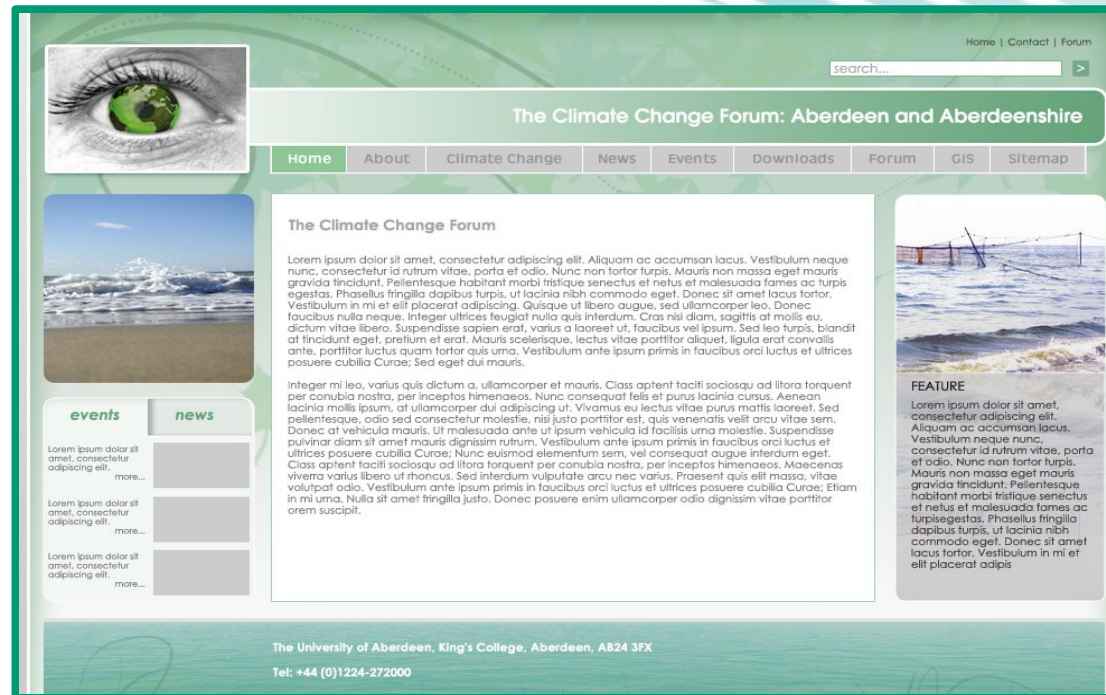
Group work: Brainstorming, Final analysis and PPT Presentation



FUTURE?




- The IMCORE Project finishes at the end of October 2011
- How will the results of IMCORE be of value?
- How will the role of the ECN continue?
- Criteria of Interreg Projects – Lasting Impact on Society


ABERDEEN CLIMATE CHANGE WEBSITE



www.aberdeencclimatechange.net

RAISING AWARENESS - LEAFLET

<p>Aberdeen Climate Change Action Plan</p> <p>The Action Plan was written by Aberdeen City Council on the basis of what we can do practically in Aberdeen in line with international and national advice on climate change. It indicates actions already underway by various services within the Council or in partnership with other agencies. The Five actions centre around:</p> <ul style="list-style-type: none"> Climate change community awareness Climate change business awareness Climate change and education Climate change and energy use in the home Climate change and energy use in the business centre 	<p>What is IMCORE?</p> <p>IMCORE (Innovative Management for Europe's Changing Coastal Resource) stands to promote an innovative and sustainable approach to reducing the impacts of climate change on coastal areas in North West Europe. It is not so much about predicting effects but offering suggestions of how we can all adapt to change. IMCORE recognizes the need for adaptations within coastal sectors such as fisheries, aquaculture, ports, shipping, marine recreation, and coastal defence. The scientists and practitioners involved in IMCORE span Ireland, the UK, France, Belgium and the Netherlands. There is a regional working partnership of IMCORE here in Aberdeen, working on coastal regeneration projects.</p>	 <p>CLIMATE CHANGE</p> 
<p>What can you do?</p> <p>Energy use: Use a greater proportion of energy from renewable sources such as wind, water and biomass. Reduce the number of 'heating' days in our office buildings</p> <p>Flooding: Update your existing emergency flood plan in conjunction with the emergency services</p> <p>Land management: Develop water storage systems to prevent summer droughts</p> <p>Transportation: Reduce staff travel to work by car and reduce car business mileage</p> <p>Waste: A new 'attitude' to waste reduction and a commitment to recycling</p> <p>Lobbying: Make MSPs and MEPs aware of the need for change in policy at national and international level</p> <p>Education: Enable children to make wise decisions about the environment and resource use</p>	<p>Sources of further information</p> <p>IMCORE: http://www.imcore.eu</p> <p>Department of Environment, Food and Rural Affairs This site gives details of the Government's policies on climate change. http://www.defra.gov.uk/</p> <p>The Hadley Centre Gives details of the latest climate change predictions http://www.met-office.gov.uk/research/hadleycentre</p> <p>UK Climate Impacts Programme Government help for organisations to assess and adapt to climate change. http://www.ukcip.org.uk/</p> <p>Energy Efficiency Best Practice UK Government advice on how to cut their energy bills by 10-20%. http://www.energy-efficiency.gov.uk/</p> <p>Energy Saving Trust Provides many tips on how to save energy around the home. http://www.est.org.uk/</p> <p>Climate change An interactive website for school children and young people aged between 7 and 16. http://www.defra.gov.uk/environment/climate-change/schools/index.htm</p> <p>With thanks to:</p>	<p>In a coastal context</p>  <p>A resource for the local people of Aberdeenshire</p>



What is climate change?

Climate change is a natural phenomena but one that can also be speeded up by human activities. The extent to which temperature change over the last 100 years is due to human activities has been studied by looking at patterns of change across the earth's surface, and in the atmosphere and the ocean. The contributions of natural effects e.g. variations in the sun's output and volcanoes, have also been studied. Natural effects were found to be unable to account for all the observed warming. Only when greenhouse gases emitted by human activities are included can the warming be explained.

What are the drivers and the impacts?

Natural drivers include changes in the earth's orbit, changes in sun intensity, volcanic eruptions (emitting greenhouse gases) and oceanic and atmospheric circulation patterns. Anthropogenic drivers include: greenhouse gas emissions (from burning fossil fuels) and land use (cover changes (e.g. deforestation)).

In the coastal zone northwest Europe, the main impacts include: sea level rise, extreme weather events, sea temperature and chemistry changes, air temperature changes and changes in precipitation (rainfall and snowfall). The following map and series of illustrations are used to explain what these impacts might really mean for coastal communities.

Climate change in a coastal context


Many people living in Aberdeenshire, particularly in the coastal zone, have questions about climate change that they don't have answers to or might be worried about the possible impacts. This leaflet aims to explain the most likely coastal impacts of climate change, based on the knowledge experts have so far. Aside from the possible problems, here are presented some practical examples of what is being done to combat climate change problems and positive ways in which everybody can get involved in the solutions.

Regional impacts

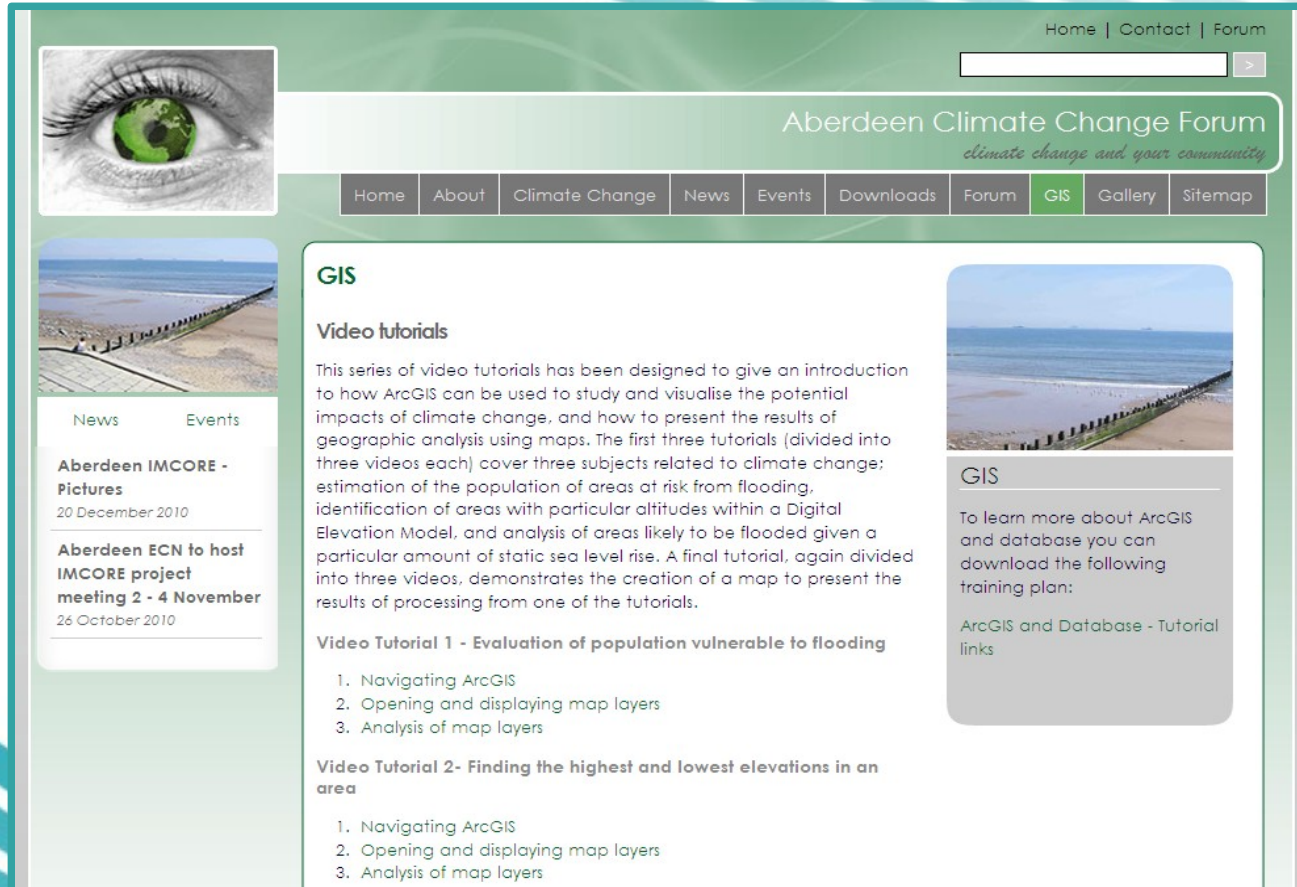
- SEA LEVEL RISE** (mm, 24 metres by 2080) may lead to the loss of coastal habitats e.g. wetlands
- EXTREME WEATHER EVENTS** such as storms may lead to severe coastal erosion in places
- SEA TEMPERATURE CHANGES** may cause the loss of native species and an increase in non-natives
- AIR TEMPERATURE CHANGES** may be positive for tourism, but may mean an increase in pollution and pests e.g. mosquitoes
- PRECIPITATION CHANGES** such as heavier rainfall may increase flooding from rivers
- SEA CHEMISTRY CHANGES** may lead to ocean acidification meaning some marine life will have problems e.g. in shell formation

Local coastal examples

- Elgin:** Increased winter rainfall by up to 25% may cause increased flood risks from rivers, such as the Don
- Spey:** Decreased rainfall in summer may cause loss of some crops and changes to moorland habitats such as those at Scotland's Nature Reserve
- Aberdeen:** Increased temperatures (from 2°C to 3.5°C by 2080) may positively affect coastal tourism in locations like Aberdeen beach
- Coastal erosion:** has had a severe effect on Aberdeen coast. A beach nourishment program and coastal defences are in place here. This has both positive and negative impacts on many sectors e.g. the shipping, transport and tourism
- The South Aberdeenshire Coastal Regeneration Project (SACRP):** focuses on Higg Bay and local area. Proposed projects here include a marine resource centre, boat ramp, artificial reef, coastal footpaths, beach ridges and landscaping.



GIS VIDEO TUTORIALS



The screenshot shows the Aberdeen Climate Change Forum website. At the top, there's a navigation bar with links for Home, Contact, and Forum. Below this is a search bar. The main header area features the forum's name and tagline, along with a secondary navigation menu including Home, About, Climate Change, News, Events, Downloads, Forum, GIS (highlighted), Gallery, and Sitemap. On the left sidebar, there are sections for News and Events, with specific announcements about IMCORE pictures and an ECN meeting. The main content area is titled 'GIS' and 'Video tutorials'. It describes a series of video tutorials designed to introduce ArcGIS and its application in studying climate change impacts. Two specific tutorials are listed: 'Video Tutorial 1 - Evaluation of population vulnerable to flooding' and 'Video Tutorial 2- Finding the highest and lowest elevations in an area', each with a numbered list of steps. On the right, there's a sidebar with a photo of a coastal area and a section titled 'GIS' that provides links to learn more about ArcGIS and download a training plan.

Home | Contact | Forum

Aberdeen Climate Change Forum
climate change and your community

Home | About | Climate Change | News | Events | Downloads | Forum | **GIS** | Gallery | Sitemap

GIS

Video tutorials

This series of video tutorials has been designed to give an introduction to how ArcGIS can be used to study and visualise the potential impacts of climate change, and how to present the results of geographic analysis using maps. The first three tutorials (divided into three videos each) cover three subjects related to climate change: estimation of the population of areas at risk from flooding, identification of areas with particular altitudes within a Digital Elevation Model, and analysis of areas likely to be flooded given a particular amount of static sea level rise. A final tutorial, again divided into three videos, demonstrates the creation of a map to present the results of processing from one of the tutorials.

Video Tutorial 1 - Evaluation of population vulnerable to flooding

1. Navigating ArcGIS
2. Opening and displaying map layers
3. Analysis of map layers

Video Tutorial 2- Finding the highest and lowest elevations in an area

1. Navigating ArcGIS
2. Opening and displaying map layers
3. Analysis of map layers

GIS

To learn more about ArcGIS and database you can download the following training plan:

ArcGIS and Database - Tutorial links

RAISING AWARENESS - ADVERTISING CAMPAIGN



MEDIA & PRESS RELEASES



← Press & Journal - Newspaper



↑ STV News - TV

EDUCATION - FIELDTRIPS & WORKSHOPS



LESSONS LEARNED

- Getting '*their*' attention
- Getting the '*right*' people involved
- Bringing '*climate change people*' together
- '*Raising awareness*' at a level beyond that of the 'media/press'
- '*Convincing people*' that climate change is important
- Getting '*Priorities*' right – at a time when other 'issues' e.g. the local economy, energy are deemed to be/perceived to be more important
- '*Educating*' – the future generations – fitting CC to the school curriculum
- Keeping the '*momentum*' going 'after' the project ends
- Devising a '*do-able*' strategy
- '*Packaging*' up what has been done here – and output from other projects e.g. **CoastAdapt** (<http://www.coastadapt.org/>) into something '*usable*' e.g. tools

Thank You

Questions?

Further Information

- imcore.eu
- www.aberdeenclimatechange.net



- Built at the mouth of two major Scottish rivers, the Dee and the Don, and covering an area of 188.48 square kilometers (72.76 square miles)
- Traditional industries such as fishing and farming in and around the city but
- Fuelled by the oil and gas industry, earning the city its epithet as 'Oil Capital of Europe'.



<http://imcore.files.wordpress.com/2009/10/ecn-aberdeen5.pdf>

